Food Insufficiency, Family Income, and Health in US Preschool and School-Aged Children

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A B S T R A C T

Objectives. This study investigated associations between family income, food insufficiency, and health among US preschool and school-aged children.

Methods. Data from the third National Health and Nutrition Examination Survey were analyzed. Children were classified as food insufficient if the family respondent reported that the family sometimes or often did not get enough food to eat. Regression analyses were conducted with health measures as the outcome variables. Prevalence rates of health variables were compared by family income category, with control for age and gender. Odds ratios for food insufficiency were calculated with control for family income and other potential confounding factors.

Results. Low-income children had a higher prevalence of poor/fair health status and iron deficiency than high-income children. After confounding factors, including poverty status, had been controlled, food-insufficient children were significantly more likely to have poorer health status and to experience more frequent stomachaches and headaches than food-sufficient children; preschool food-insufficient children had more frequent colds.

Conclusions. Food insufficiency and low family income are health concerns for US preschool and school-aged children. (*Am J Public Health.* 2001;91: 781–786)

Rates of welfare use decreased 46% from 1996 to 1998, and as a result welfare reform has been trumpeted as a "success."[1] Nonetheless, an astounding 20% of US children still live in poverty.[2] As a result of the dynamic nature of poverty, most poor children will not be poor for their entire childhood;[3] however, 34% of US children will experience poverty during at least 1 year of their lives by the time they reach 17 years of age.[4] Although moving parents from welfare to work has decreased the number of families on welfare, it has not decreased the child poverty rate[2] and, in fact, has increased the number of poor families without essential supports such as food stamps.[5]

Poverty has consequences for children. Extensive research has demonstrated that poverty adversely affects children's growth, cognitive development, academic achievement, and physical and emotional health.[6–11] Many forms of deprivation are associated with poverty, including poor housing and lack of adequate medical care. In this study, we were interested in a form of deprivation that has been relatively unexplored in the United States: hunger or food insufficiency. Chronic or persistent hunger has long been suspected to lead to poor health in US children, over and above the effects of low family income; until recently, however, empiric studies designed to test this hypothesis have been sparse. One study, the Community Childhood Hunger Identification Project, conducted from 1992 through 1994, showed that poor, hungry children were more likely than poor but not hungry children to suffer from health problems such as frequent colds, ear infections, anemia, asthma, and frequent headaches.[12]

In this article, we examine the relationships between family income, family food insufficiency, and health measures in US children, using data from the third National Health and Nutrition Examination Survey (NHANES III).

Methods

NHANES III Data

NHANES III data for children aged 1 to 5 years (n=6154) and 6 to 16 years (n=5667) were analyzed. NHANES III, conducted from 1988 to 1994, was a cross-sectional representative survey of the US civilian noninstitutionalized population residing in households. Detailed descriptions of the sample design and operation of the survey have been published elsewhere.[13] NHANES III included both medical examinations and interviews conducted with survey participants and their proxies. Eighty-nine percent of the proxy respondents were mothers of the child, and 6% were fathers; the remaining respondents were other relatives or caretakers familiar with the child.

Sociodemographic and Family Characteristics

For each child in the survey, a responsible adult living in the home provided information about sex, age, race/ethnicity, health insurance status, family size, family income, and employment status and education of the head of the family. The head of the family was the person who owned or rented the home where the child lived.

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Total family income for the previous 12 months was reported in categories ranging from less than $1000 to $80 000 or more. A poverty index ratio was then calculated by comparing the midpoint of the category and the child's family size with the federal poverty line.[14] These analyses used 3 family income categories: low income (a poverty index ratio less than or equal to 130% of the poverty line), middle income (more than 130% to 350% of the poverty line), and high income (more than 350% of the poverty line). A child was defined as insured if she or he was covered during the previous month by private health insurance, military health care insurance, or Medicaid and if the coverage paid for "more than accidents."

Because one of our outcome measures was reported health status, it was necessary to control for the language in which the interview was conducted. Previous research has demonstrated that as a result of translation of the health status question, Spanish speakers may answer this question differently than would English speakers.[15–17] For all analyses, information on race, ethnicity, and the language used during the proxy interview was used to classify children into 4 racial/ethnic categories: (1) all non-Hispanic White children and "other" children with an interview conducted in English, (2) all non-Hispanic Black children, (3) Mexican American children with an interview conducted in English, and (4) Mexican American or "other" children with an interview conducted in Spanish.

Location

Metropolitan vs nonmetropolitan area was assessed on the basis of the US Department of Agriculture rural/urban continuum codes.[18] Central or fringe counties of metropolitan areas with populations of 1 million or more were classified as metropolitan, and all other areas were classified as nonmetropolitan.

Past Health Risk

For children aged 1 to 5 years, information was collected on mother's age at birth, presence of birth complications, low birthweight (below 2500 g), any prenatal smoke exposure, and whether they were breastfed for 30 days or more.

Health Care/Environmental Risk

For all children, information was collected on whether they had a regular source of health care, whether they had attended day-care centers where there were 6 or more children before they were 4 years old, and the number of cigarettes smoked per day in the household.

Food Insufficiency

For the purposes of NHANES III, food insufficiency was defined as "an inadequate amount of food intake due to a lack of resources." A child was classified as "food insufficient" if the respondent to the family questionnaire reported that the family either "sometimes" or "often" did not get enough food to eat. This question has undergone cognitive testing and has been shown to be valid,[19–24] and an association has been demonstrated between responses to the question and food expenditures as well as nutrient and food group intake.[25–27]

Health Measures

We used proxy-reported health status to provide a general summary of children's health. Proxy respondents for the household youth questionnaire were asked to describe the child's health as excellent, very good, good, fair, or poor. For this analysis, the fair and poor categories were combined. Other health measures included frequency of headaches and stomachaches (range: always, frequently, sometimes, never/rarely), number of lifetime ear infections (range: 0 to more than 5), number of colds in the past 12 months (range: 0 to more than 3), and presence of an impairment that kept the child from usual activities (for children aged 1 to 5 years) or from attending school (for children aged 6 to 16 years). Iron deficiency was determined according to guidelines via cutoff values for serum ferritin, transferrin saturation, and erythrocyte protoporphyrin.[28]

Physician-reported health status was not used because the rating was based on a single observation during the survey examination. Because physicians rated fewer than 1% of children as being in fair or poor health, the measure did not capture sufficient variation to be useful in comparing food-sufficient and food-insufficient children.

It is important to keep in mind that health indicators can be measured by proxy report, laboratory measures, or physical examination. All of the outcome indicators reported in this article were proxy reported except for iron deficiency, which was measured via laboratory tests.

Statistical Analysis

Sample weights were created for the NHANES III data to account for the oversampling of certain groups, such as Blacks and Mexican Americans, as well as for nonresponse. NHANES III weighted data were analyzed with the *svy* commands available in Stata.[29] These commands used the weights and survey cluster design to calculate point estimates and variances.

Ordinal logistic regression models (for proxy-reported health status and frequency of stomachaches, headaches, colds, and ear infections) and logistic regression models (for iron deficiency and limited activities) were created to test the hypothesis that food insufficiency is a predictor of poorer health independent of other potential confounders. Control variables included age, sex, race/ethnicity, poverty index ratio (as a continuous variable), and all of the other sociodemographic, location, family, past health risk, health care risk, and environmental risk variables described earlier.

Ordinal logistic regression analyses were used to calculate odds ratios for outcome categories, taking into account the ordering of categories. These odds ratios allowed us to compare a set of categories of the health measures with those categories above it, and the overall odds ratio represented the likelihood that a child would be grouped in a poorer health category. For proxy-reported health status, an additional model was created that tested the policy-relevant interaction between family income and food insufficiency.

In the case of prevalence estimates, missing data were excluded from the analyses. For the regression analyses, all missing data other than food insufficiency status were imputed via the *impute* command in Stata, which used regression equations to fill in missing values based on other nonmissing data in the child's record. Variables included in these regression equations were chosen separately for each imputed variable via backward stepwise regression to screen for associated variables. In the case of dichotomous variables, *impute* was used to predict a probability, and a random value was selected on the basis of this probability. The number of missing values imputed ranged from no missing values in regard to whether the child had a regular source of health care to 1066 missing values for family poverty index ratio.

Results

As shown in Table 1, more than 15% of children from low-income families and about 2% of children from middle-income families were food insufficient during 1988 through 1994. In comparison with food-sufficient children, food-insufficient children were more likely to be in low-income families, to lack health insurance or a regular source of health care, to have been born to a young mother, and to live in families in which the head of the family did not have a high school education, was not married, or was unemployed.

Low-income preschool children were significantly more likely than high-income preschool children to have been reported as being in fair or poor health, always having stomachaches, having a restricting impairment, having had fewer colds in the past year, having had a lower number of lifetime ear infections, and having been iron deficient (Table 2). Low-

TABLE 1—Sociodemographic Characteristics of Children Aged 1–16 Years, by Family Income and Food Sufficiency Status: NHANES III, 1988–1994

	Family Income				
	Low (n=5330)	Middle (n=4200)	High (n=1225)	Food Insufficient (n=1313)	Food Sufficient (n=10469)
Family income, % (SE)					
Low income	. . .	. . .	. . .	85.7 (3.3)	28.5 (1.4)
Middle income	. . .	. . .	. . .	14.2 (3.3)	49.1 (1.6)
High income	. . .	. . .	. . .	0.0 (0.0)	22.4 (1.5)
Food insufficient, % (SE)	15.7 (1.3)	1.8 (0.4)	0.0 (0.0)	. . .	. . .
Race/ethnicity, % (SE)					
Non-Hispanic White	51.6 (3.2)	80.6 (1.1)	92.6 (0.9)	44.7 (4.7)	74.8 (1.4)
Non-Hispanic Black	27.0 (2.4)	12.2 (0.9)	5.4 (0.7)	26.0 (3.7)	15.1 (1.1)
Mexican American, English interview	7.0 (0.6)	4.9 (0.6)	2.1 (0.4)	9.8 (1.4)	4.7 (0.5)
Mexican American, Spanish interview	14.5 (2.2)	2.4 (0.5)	0.0 (0.0)	19.6 (2.9)	5.4 (0.8)
Age, y, mean (SE)	7.9 (0.1)	8.5 (0.1)	8.6 (0.2)	8.0 (0.3)	8.4 (0.1)
Female, % (SE)	50.6 (1.5)	47.3 (1.2)	50.2 (2.4)	50.3 (2.6)	48.7 (0.8)
Metropolitan area, % (SE)	45.5 (5.1)	46.1 (5.5)	58.6 (6.9)	49.7 (5.8)	48.8 (5.1)
Family size, mean (SE)	5.0 (0.1)	4.6 (0.1)	3.9 (0.1)	5.1 (0.2)	4.5 (0.0)
Family head education, % (SE)					
Less than high school	46.4 (1.8)	15.0 (1.2)	3.6 (0.8)	57.7 (3.4)	21.5 (1.0)
High school graduate	37.8 (1.9)	40.0 (1.6)	20.8 (2.4)	31.0 (4.1)	35.0 (1.2)
More than high school	15.8 (1.7)	45.0 (1.5)	75.7 (2.3)	11.3 (2.1)	43.5 (1.4)
Family head unemployed, % (SE)	44.9 (2.3)	7.6 (0.9)	2.0 (0.5)	46.4 (4.2)	17.2 (1.0)
Family head not married, % (SE)	46.2 (2.1)	16.6 (1.1)	6.1 (1.1)	51.6 (4.3)	22.4 (1.1)
Mother ≤18 years at delivery, %	8.6 (0.6)	4.2 (0.5)	0.6 (0.2)	8.9 (1.3)	4.9 (0.3)
No health insurance, % (SE)	20.1 (2.1)	7.5 (1.2)	1.5 (0.9)	18.8 (2.8)	9.8 (1.0)
No regular source of health care, % (SE)	13.1 (1.2)	7.3 (0.7)	4.2 (1.0)	16.8 (2.1)	8.2 (0.6)

Note. Low income = family income less than or equal to 130% of poverty line; middle income = family income between 130% and 350% of poverty line; high income = family income greater than or equal to 350% of poverty line.

TABLE 2—Prevalence of Health Indicators, by Family Income and Food Sufficiency Status, Among Preschool and School-Aged Children: NHANES III, 1988–1994

	Preschool Children (n=6154)					School-Aged Children (n=5667)				
Health Indicator	Low Income	Middle Income	High Income	Food Insufficient	Food Sufficient	Low Income	Middle Income	High Income	Food Insufficient	Food Sufficient
Fair/poor health, % (SE)	8.2 (0.6)[a]	2.6 (0.5)[a]	0.6 (0.3)	14.6 (2.3)	3.6 (0.3)	9.6 (1.2)[a]	2.9 (0.6)	1.5 (0.5)	12.4 (2.0)	4.3 (0.5)
Always experiences headaches,[b] % (SE)	4.0 (1.2)	1.0 (0.5)	1.1 (0.8)	8.2 (4.5)	1.6 (0.4)	9.7 (1.3)[a]	8.7 (1.0)[a]	5.8 (1.2)	13.2 (3.3)	8.4 (0.7)
Always experiences stomachaches,[b] % (SE)	5.5 (1.5)[c]	2.8 (0.8)	2.1 (0.8)	9.0 (4.2)	3.3 (0.5)	6.7 (0.9)	6.4 (1.0)	4.5 (1.0)	11.1 (2.3)	5.7 (0.6)
No. of colds in past 12 mo, mean (SE)	2.5 (0.1)[a]	2.6 (0.1)[a]	3.0 (0.1)	3.2 (0.3)	2.6 (0.0)	1.9 (0.1)	1.7 (0.1)[c]	1.9 (0.1)	2.4 (0.4)	1.8 (0.0)
No. of ear infections in lifetime, mean (SE)	1.7 (0.1)[a]	2.1 (0.1)[a]	2.4 (0.1)	1.8 (0.1)	2.0 (0.0)	1.5 (0.1)[a]	2.1 (0.1)[a]	2.5 (0.1)	1.5 (0.1)	2.0 (0.0)
Restricting impairment, % (SE)	2.7 (0.5)[a]	1.4 (0.5)	0.7 (0.4)	3.8 (1.8)	1.6 (0.3)	0.8 (0.2)	0.8 (0.3)	0.7 (0.4)	1.8 (0.9)	0.7 (0.2)
Iron deficiency, % (SE)	12.2 (1.3)[a]	7.4 (1.2)[c]	4.7 (1.2)	11.6 (2.4)	8.6 (0.8)	5.6 (1.1)[a]	2.9 (0.7)[a]	0.7 (0.3)	3.9 (1.0)	3.4 (0.5)

Note. Low income = family income less than or equal to 130% of poverty line; middle income = family income between 130% and 350% of poverty line; high income = family income greater than or equal to 350% of poverty line.
[a]Significantly different from high-income group after control for age and sex, $P < .05$.
[b]Available only for children aged 4–16 years.
[c]Significantly different from high-income group after control for age and sex, $P < .10$.

income school-aged children were more likely to have been reported to be in fair or poor health, to always have headaches, to have had a lower lifetime number of ear infections, and to have been iron deficient.

Race/ethnicity was not controlled for in the statistical tests used to generate the data displayed in Table 2. Recent research has shown that 69% of African American children will be poor during at least 1 year of their childhood, as compared with 26% of White children.[4] Consequently, it is impossible to adequately assess the effect of poverty while statistically controlling for race/ethnicity, because poverty status is intertwined with race/ethnicity.[30] Instead, prevalence rates of fair/poor health are reported by family income for each racial/ethnic group in Table 3.

Among the preschool group, low-income non-Hispanic White and non-Hispanic Black children, but not Mexican American children, were more likely to be reported as in fair or poor health than high-income children. Among the school-aged group, low-income non-Hispanic White and Mexican American children, but not non-Hispanic Black children, were more likely to be reported as in fair or

TABLE 3—Prevalence of Poor or Fair Health, by Family Income and Race/Ethnicity, Among Preschool and School-Aged Children: NHANES III, 1988–1994

Race/Ethnicity	Preschool Children, % (SE)				School-Aged Children, % (SE)			
	Low Income	Middle Income	High Income	Total	Low Income	Middle Income	High Income	Total
Non-Hispanic White	4.4 (1.0)[a]	1.8 (0.5)[b]	0.5 (0.3)	2.2 (0.4)	4.4 (1.3)[a]	2.7 (0.7)	1.3 (0.5)	2.7 (0.4)
Non-Hispanic Black	8.0 (1.0)[a,c]	1.5 (0.7)	0.7 (0.7)	5.2 (0.7)[c]	9.2 (1.2)[c]	3.8 (0.9)	3.7 (2.0)[d]	7.1 (0.8)[c]
Mexican American, English interview	7.6 (1.5)[d]	5.9 (1.8)[c]	5.1 (2.6)[c]	6.6 (1.1)[c]	14.3 (2.1)[b,c]	3.4 (0.6)	3.9 (2.3)	7.6 (1.0)[c]
Mexican American, Spanish interview	20.8 (2.1)[c]	29.2 (8.3)[c]	. . .	22.1 (2.0)[c]	27.4 (4.9)[c,e]	3.8 (1.2)	. . .	21.6 (3.3)[c]

[a]Significantly different from high-income children after control for age and sex, $P < .05$.
[b]Significantly different from high-income children after control for age and sex, $P < .10$.
[c]Significantly different from non-Hispanic White children after control for age and sex, $P < .05$.
[d]Significantly different from non-Hispanic White children after control for age and sex, $P < .10$.
[e]Significantly different from middle-income children after control for age and sex, $P < .05$.

TABLE 4—Odds Ratios for Poorer Health Indicators Among Food-Insufficient vs Food-Sufficient Children: NHANES III, 1988–1994

	Preschool Children (n = 6129)		School-Aged Children (n = 5651)	
	Odds Ratio[a]	95% CI	Odds Ratio[a]	95% CI
Proxy-reported health status	1.49	1.10, 2.03	1.58	1.16, 2.18
Stomachaches[b]	3.00	1.90, 4.81	1.88	1.31, 2.69
Headaches[b]	2.48	1.51, 4.14	1.67	1.14, 2.44
Colds	1.57	1.15, 2.16	1.51	0.89, 2.59
Ear infections	1.14	0.85, 1.54	1.07	0.73, 1.57
Iron deficiency	0.84	0.53, 1.34	0.66	0.34, 1.27
Restricting impairment	1.77	0.53, 5.87	3.56	0.90, 14.01

Note. CI = confidence interval.
[a]Adjusted for sociodemographic and family characteristics, location, past health risk, health care risk, and environmental risk.
[b]Available only for children aged 4–16 years.

poor health. Overall, the prevalence rate of fair/poor health was greater among non-Hispanic Black children, English-speaking Mexican American children, and Spanish-speaking Mexican American children than among non-Hispanic White children.

Food-insufficient children had worse outcomes on each health measure studied except for number of ear infections in the past year (Table 2). Because food insufficiency is associated with family income, race/ethnicity, and other sociodemographic characteristics, ordinal logistic and logistic regression analyses were performed to determine whether these associations remained after adjustment for potential confounders. In both age groups, food-insufficient children, in comparison with food-sufficient children, were significantly more likely to be in poorer health and to have more frequent stomachaches and headaches but not to have more frequent ear infections, iron deficiency, or activity-limiting impairments (Table 4). In addition, food-insufficient preschool children had experienced more colds in the previous year.

Not having enough food to eat produces additional health risks among both low-income and middle-income children. Not having enough food to eat increased the odds of being in poorer health from 2.2 to 3.3 for low-income children and from 1.6 to 3.5 for middle-income children (vs high-income children; Table 5).

Discussion

Food-insufficient children are more likely than food-sufficient children to live in low-income families and to be without health insurance and a regular source of health care. Although food insufficiency disproportionately affects minority children and children living in single-parent families, the majority of food-insufficient children in the United States are non-Hispanic White, live in 2-parent families, and have at least 1 parent who is working.[21] Above and beyond these social characteristics, however, this research demonstrates that living in a family that does not have enough food to eat has a negative impact on children's health.

Children who did not get enough food to eat were significantly more likely to be reported as being in poorer health, even after adjustment for potential confounding factors such as family income, other sociodemographic char-

TABLE 5—Odds Ratios for Poorer Health Status, by Poverty and Food Sufficiency Status, Among Children Aged 1–16 Years: NHANES III, 1988–1994

	Odds Ratio[a]	95% Confidence Interval
Low income, food insufficient	3.32	2.39, 4.57
Low income, food sufficient	2.23	1.63, 3.03
Middle income, food insufficient	3.53	2.10, 5.93
Middle income, food sufficient	1.60	1.31, 1.97
High income	1.00	

Note. Low income = family income less than or equal to 130% of poverty line; middle income = family income between 130% and 350% of poverty line; high income = family income greater than or equal to 350% of poverty line.
[a]Adjusted for age, sex, poverty index ratio, race/ethnicity, education and employment status of head of family, metropolitan area, family size, day care, marital status of head of family, health insurance, regular source of health care, and household smoke exposure (n = 11779).

acteristics, location, and past health, health care, and environmental risks. Food-insufficient children were also more likely to have more frequent stomachaches, more frequent headaches, and, among preschool children, more frequent colds. Not having enough food to eat acts in addition to income level to increase low- and middle-income children's risk of poor health.

Low-income children were significantly more likely than high-income children to be reported to be in fair or poor health, to be iron deficient, and, in the younger group, to have an impairment limiting their activities. Low-income children had fewer colds (in the younger group) and fewer lifetime ear infections. Although at first surprising, this disparity in colds and ear infections may be related to increased day-care participation and physician use (causing higher rates of diagnosis) among higher-income children.[10,31]

One cannot study poverty and hunger in the United States without noting the marked disparity of hardship among racial/ethnic groups. These national data show that non-Hispanic Black and Mexican American children are more likely than non-Hispanic White children to be poor, food insufficient, and in poor health. The large increase in the prevalence of fair or poor health among Mexican American children whose proxy completed the interview in Spanish (21.8%) relative to those whose proxy completed the interview in English (7.3%) may have been due to greater hardships associated with recent immigration. However, it is possible that the translation of the health status question also contributed to the observed disparity.[15–17]

The findings that poverty and lack of adequate food are associated with poorer health status are particularly alarming in light of recent evidence that social inequalities in health persist into adulthood. A number of studies have shown that adults who had economic problems during childhood are more likely to rate themselves as poor or "below good" in terms of health status.[32–35]

The use of proxy-reported health measures is not without limitations, particularly in assessments of the relationship between health and another proxy-reported variable such as food insufficiency. For each child included in NHANES III, both food insufficiency and all of the health measures reported here, with the exception of iron deficiency, were assessed by the same proxy, most often the mother. It is possible that part or all of the association found was due to a tendency of the proxy to overreport poor outcomes.

Extensive study has shown self-reported health status to be valid and reliable in adult populations,[36] to predict mortality and disability,[17] and to sum together the different components of how people perceive their overall health.[37,38] However, research on the relationships between proxy-reported health status and "objectively" measured outcomes among children has been much more limited. One study of preterm low-birthweight infants showed that a mother's assessment of her infant's health status was significantly related to use of child outpatient services and child behavior problems,[39] although another study indicated that mothers' reports of their children's health status might be affected by their own psychologic state.[40]

However, comparisons between children's health status as reported by their parents and by the children themselves have shown the reports to be consistent.[41] Furthermore, in this sample of children, proxy-reported health status was significantly associated with number of colds in the previous 12 months, frequency of stomachaches and headaches, iron deficiency, blood lead concentration, presence of a persistent cough in the past 12 months, and presence of an impairment or health problem that kept the child from engaging in his or her usual activities or attending school (data not shown).

There are other limitations of this research. Although we controlled for most known confounding factors in the relationship between food insufficiency and health, we were not able to control for other potentially important characteristics related to children's health, such as family income at earlier stages of the child's life or quality of health care received. In addition, our analyses do not shed light on the mechanism for the relationship between food insufficiency and health among US children. It is possible that being deprived of food affects health through biological means such as reduced food intake, food quality, or micronutrient deficiencies; through psychologic means such as increased stress, worry, or feelings of deprivation; or through other means.

It is also possible that family food insufficiency affects children's health through food deprivation of their parent(s), not the children themselves, which may cause changes in parenting practices. Finally, because our data were cross sectional, it is not possible to determine whether the relationship found between food insufficiency and health is causal or whether the relationship exists because children's poor health, which may require high expenditures for health care, contributes to their family's inability to acquire adequate food (reverse causality).

However, demonstration of an association between food insufficiency, poverty status, and children's poor health, regardless of the causal direction, once again highlights that poor American children are at increased risk of poorer health. This study confirms that our social safety net has child-sized holes. There is evidence that these holes are not diminishing and, in fact, may be widening as welfare reforms take effect.[42,43] Although NHANES III was conducted before welfare reform and cannot be used to assess the effects of welfare reform, it is important to interpret these results in light of current welfare policy.

Previous research involving NHANES III data has shown that the demographic risk factors for food insufficiency are low family income, being non-Hispanic Black or Mexican American, lacking health insurance, living in a single-parent family, and having a family head who does not have a high school education.[21] However, at the same income level, children in working families are just as likely to be food insufficient as those in nonworking families.[21] This means that welfare reform's focus on moving parents to work will not increase a poor family's food security if the jobs they find do not pay living wages or provide health insurance. A report summarizing results from 11 states showed that only 50% to 60% of former welfare recipients are working and that most of the jobs they find pay only between $5.50 and $7.00 per hour, not enough to pull families out of poverty.[42]

Furthermore, since the beginning of welfare reform, there has been an unexpected decline in Food Stamp Program participation, even among eligible clients and even though the poverty rate has not diminished.[5] There is evidence from some states that former welfare recipients are reporting an increase in their inability to buy food, and in 1997 the US Conference of Mayors reported an increase in demand for emergency food.[42–44] Emergency food, though temporarily essential for some families, necessitates families' reliance on the temperamental nature of nonentitlement charity and will represent only a minor part of the long-term solution to food insecurity in the United States.[45]

The *Healthy People 2010* objectives include increasing the food security of American households.[46] The present research underscores the urgency for achieving this objective by demonstrating that, over and above living in poverty, living in families that do not get enough food to eat is associated with adverse health outcomes among US children, and thus that food security is a critical component of child health policy. Ensuring that all American children are adequately fed is a step that should be taken to improve the health of our nation's children. □

Contributors

K. Alaimo planned the study design, analyzed the data, interpreted the results, and wrote the first draft of the paper. C. M. Olson and E. A. Frongillo Jr assisted in designing the study and interpreting the results and

edited drafts of the paper. R. R. Briefel planned the NHANES III food sufficiency questionnaire and nutrition component, participated in study design and data interpretation, and edited drafts of the paper.

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